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Decay spectroscopy of the lightest proton-emitting Re isotopes IAIN DARBY, University of Liverpool, DAVID JOSS, ROBERT PAGE, JUHA UUSITALO, JOHN SIMPSON, GREAT COLLABORATION — Proton emission is expected to determine the limit of experimental observation for the neutron-deficient nuclei of most elements. Proton radioactivity may be treated as a simple quantum tunnelling process through the Coulomb barrier. The barrier penetration probability (and thus the decay half- lives) for proton emitters are sensitive to the proton decay energies and the orbital angular momentum of the initial state from which emission occurs. Therefore proton radioactivity is an ideal mechanism with which to determine and characterise single-particle states beyond the proton drip line. Additionally the characteristics (short half- lives and discrete energies) of the emitted protons are ideal for tagging in γ-ray spectroscopy experiments. A decay spectroscopy experiment has been performed at the Accelerator Laboratory of the University of Jyväskylä (JYFL), using the RITU separator in conjuction with the GREAT focal-plane spectrometer (which possesses a high efficiency for delayed γ-rays), to study the lightest Re nuclei via the reaction ^{106}Cd(^{58}Ni,pxn). The first observation of the lightest known proton-emitting isotope ^{159}Re will be presented. In ^{160}Re the observation of γ-ray transitions feeding the known $d_{3/2}$ ground state which may account for the non-observation of particle mission from the anticipated $h_{11/2}$ isomeric state is eported.

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